Internal Government Studies

1995

Reports and Presentations

Study Name: **Interferometer Thermal Sounder [ITS] - Part II**

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INTERNAL GOVERNMENT STUDIES - FY 1995
Interferometer Thermal Sounder [ITS] - Part II

Presentation/Paper Title	Author(s)	Date
"Final Report to the Integrated Program Office on the Interferomter Thermal Sounder Study: Part II	Sussklnd, McMillan, Goldberg	15 NOV 95
"IGS Final Presentations for FY95: Interferometer Thermal Sounder (ITS)-[PART II: ITS versus AIRS Tradeoff]"	Goldberg, McMillan, Susskind, Smith, Huang	29 SEPT 95
"IGS Final Presentations for FY95: Interferometer Thermal Sounder (ITS)-Comparative Study of Performance of ITS versus AIRS"	Goldberg, McMillan, Susskind, Smith, Huang	29 SEPT 95
"Interferometer Thermal [Sounder (ITS)-Part II ITS versus AIRS Tradeoff] - Midterm Presentations"	Goldberg, McMillan, Susskind, Smith, Huang	29 JUNE 95
"Primary Differences Between AIRS and ITS"	Joel Susskind	29 JUNE 95
"POES CARD Input for ITS-part II"	Mitch Goldberg	18 APRIL 95
"High Resolution Transmittance for ITS versus AIRS"	Larry McMillan	3 JULY 95
"Preliminary Report on ITS Simulation Study"	Joel Susskind	18 APRIL 95
"ICS Monthly Status Report on ITS"	Mitch Goldberg	18 APRIL 95

Preliminary Report on ITS Simulation Study - 4/18/95

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This is a joint study between J. Susskind at GSFC and M. Goldberg and L. McMillin at NOAA/ORA. The purpose of the ITS simulation study is to do detailed, realistic simulation studies to assess the ability of ITS to meet sounding requirements for the converged platform, as well as compare ITS capabilities to those of AIRS. Such studies require the ability to simulate instrumental observations, taking into account their appropriate dependence on surface and atmospheric conditions, as well as instrument characteristics such as noise. Such detalled simulations are routinely done by the AIRS team for AIRS and the methodologies used for AIRS simulations lay a good groundwork for what might be done to simulate ITS. One important point found in the AIRS simulations is the need to have the simulations include a reasonably accurate dependence of atmospheric transmittances on atmospheric temperature and constituent profile, as well as effects of clouds on the radiances. For comparison purposes, simulations for AIRS and ITS must be done otherwise identically, other than differences due to instrument characteristics.

The critical part in designing and conducting the comparative simulation studies is the ability to realistically simulate the dependence of ITS observations on atmospheric and surface conditions. Unlike AIRS observations, ITS spectral channels are not localized in frequency and their spectral response functions extend over large spectral intervals. For this reason, a simplifying assumption used to simulate AIRS channel observations may not be adequate enough and will require testing. Current thinking is leaning toward simulation of the interferogram itself as a function of atmospheric conditions and then transforming this to spectrum space. In prlnclple, we know how to handle the problem but some further code development Is necessary.

There will be a meeting on April 20 in which Dan Mooney of Lincoln Labs will present instrumental characteristics of ITS and then M. Goldberg, L. McMillin, myself, and my colleague C. Barnet will discuss details of the simulation methodology to be used. In the shortest run, we plan to test first the effects of increased ITS noise, as compared to AIRS, on retrieval accuracy. Simulations will be done using AIRS transmittance functions for both instruments but with ITS and AIRS instrumental noise levels for the two Instruments. Simulations will be done for both clear

and cloudy conditions, because cloudy cases are more sensitive to increased noise levels. Results should be available by June 30.

If all goes well, we may have simulations for clear cases using ITS spectral characteristics done by September 30. On the other hand, unforseen complications with regard to simulating the interferometric observations could delay this schedule. The real test involves cloudy simulations with ITS characteristics, This will probably take a few more months but may be achievable by December 30, 1995. A particular complication for the cloudy simulations using ITS arises because the 3 x 3 array of spots used In the treatment of cloud effects on the observed radiances are all measured by different detectors in the case of ITS. This puts a potentially tight constraint on the relative calibration of each detector, because the methodology interprets radiance differences between spots as being due to differences in cloudiness between the different spots. Effects of small calibration differences have to be tested within the context of the retrieval methodology in cloudy cases.